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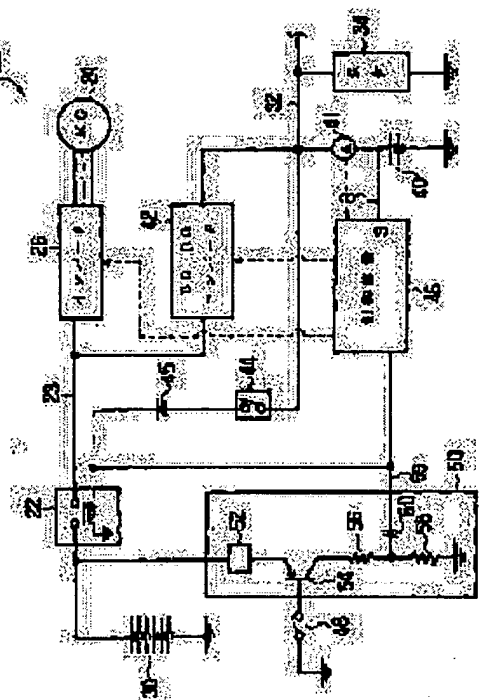
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(54) POWER SUPPLY SYSTEM

(57)Abstract:

PROBLEM TO BE SOLVED: To supply equipment with power, if one of two batteries is fully discharged, from the other, and charge the fully discharged battery at the same time.

SOLUTION: An operation circuit 50 is installed which adjusts a power of 36 V voltage from a high-voltage battery 30 to 12 V voltage and supplies it to a relay 22 and a controller 46 by turning on and emergency switch 48. In addition, a DC-to-DC converter 42 which converts power from a high-voltage power line 23 to 14 V voltage, based on a control signal outputted from the controller 46 as the result of that power supply and supplies it to a low-voltage power line 32 is installed. Thus a power supply system 20 is started for driving a generator-motor 24 and a load 34, and at the same time, a low-voltage battery 40 is charged by turning on the emergency switch 48.



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CLAIMS

[Claim(s)]

[Claim 1] A power supply system which is characterized by providing the following and which has at least two batteries to a power supply ***** which performs electric supply from a battery of another side to electric supply Rhine of one [this] battery possible [charge of one / this / battery] at least in response to electric supply from one side of said two batteries An emergency switch An actuation circuit which operates said ***** by electric supply from a battery of said another side performed based on this actuation when this emergency switch is operated

[Claim 2] It is the power supply system which is a power supply system according to claim 1, and is a means by which operate by electric supply from electric supply Rhine of one [said] battery, and have a connection switch which manages connection between a battery of said another side, and said *****, and said actuation circuit makes connection by said connection switch by electric supply from a battery of said another side when said emergency switch is operated.

[Claim 3] A power supply system [equipped with an electric power switch which manages electric supply to said connection switch from one / said / battery] according to claim 2.

[Claim 4] A power supply system [equipped with a motor generator connected to said ***** road side of said connection switch] according to claim 2 or 3.

[Claim 5] There is no claim 1 equipped with a supply interruption circuit which suspends actuation of said ***** by electric supply from a battery of this another side although said emergency switch is ON when voltage of a battery of said another side turns into under predetermined voltage, and said actuation circuit is the power supply system of a publication 4 either.

[Claim 6] It is the power supply system equipped with a control circuit which controls electric supply to electric supply Rhine of one [this] battery based on a condition of one [said] battery that said ***** was detected by said condition detection means by having claim 1 thru/or a condition detection means to be the power supply system of a publication 5 either, and to detect a condition of one [said] battery.

[Claim 7] It is the power supply system which is the circuit controlled so that electric supply to electric supply Rhine of one [said] battery is stopped, when current with which it is a power supply system according to claim 6, said condition detection means is a means to detect current which flows to one [said] battery, and said control circuit was detected by said condition detection means is under predetermined current.

[Claim 8] There is no claim 1 which is the circuit to which electric power can be supplied from one [said] battery in electric supply Rhine of a battery of this another side possible [charge of a battery of said another side], and said ***** is the power supply system of a publication 7 either.

[Claim 9] There is no claim 1 which is the system which supplies power in a load which was carried in vehicles and carried in these vehicles, and said power supply system is a power supply system of a publication 8 either.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to a power supply system.

[0002]

[Description of the Prior Art] Conventionally, as this kind of a power supply system, rated voltage is in abbreviation etc. by carrying out, and the thing which comes to connect the battery whose number is two through the DC to DC converter of bidirection is proposed (for example, JP,5-336670,A etc.). In this system, one amount of accumulation of electricity of the two batteries falls, and when it results in the condition that the so-called battery went up, the drive of the device which receives supply of power from two batteries is enabled by charging one battery with the battery of another side using a DC to DC converter.

[0003]

[Problem(s) to be Solved by the Invention] However, in such a power supply system, a device may be unable to be driven until charge is completed to some extent. When one side of a battery carries out full discharge, charge is needed until it will be in the condition that the power which can drive a device can be discharged, and the time amount for the charge is required. It will become impossible to put vehicles into operation, if the case where such a power supply system is carried in vehicles is taken into consideration until charge of a battery is completed to some extent.

[0004] When one side of the two batteries carries out full discharge of the power supply system of this invention, it sets to one of the purposes to perform to coincidence charge of a battery which used the power from the battery of another side and carried out full discharge with supply of the power to a device.

[0005]

[The means for solving a technical problem, and its operation and effect] The power supply system of this invention took the following means, in order to attain a part of above-mentioned purpose [at least].

[0006] The power supply system of this invention is a power supply system which has at least two batteries to a power supply. ***** which performs electric supply from the battery of another side to electric supply Rhine of one [this] battery possible [charge of one / this / battery] at least in response to the electric supply from one side of said two batteries, When an emergency switch and this emergency switch are operated, let it be a summary to have the actuation circuit which operates said ***** by electric supply from the battery of said another side performed based on this actuation.

[0007] In the power supply system of this this invention, if an emergency switch is operated, an actuation circuit will operate ***** by electric supply from the battery of another side performed based on this actuation. Electric supply from the battery of another side is performed to electric supply Rhine of a battery possible [carrier beam ***** / while] for charge of one battery in electric supply. Furthermore, ***** receives the electric supply from one battery. Therefore, in the condition of full discharge, only by operating an emergency switch, while being able to operate a power supply system, one battery can be charged [the time of one battery being in the condition to which the amount of accumulation of electricity fell, or].

[0008] In the power supply system of such this invention, it shall operate by electric supply from electric supply Rhine of one [said] battery, and shall have the connection switch which manages connection between the battery of said another side, and said ***** , and said actuation circuit shall be a means to make connection by said connection switch by electric supply from the battery of said another side, when said emergency switch is operated. In the power supply system of this invention of this mode, it shall have the electric power switch which manages the electric supply to said connection switch from one [said] battery. If an emergency switch is operated, since electric power will be supplied by ***** in electric supply Rhine of one battery, electric supply is performed also on the connection

switch which operates by electric supply from this electric supply Rhine. Therefore, once it sets an emergency switch to ON, actuation of a power supply system and charge of one battery are continuable, since a connection switch does not serve as OFF by electric supply from electric supply Rhine considering an emergency switch as OFF, where an electric power switch is set to ON also as OFF after that.

[0009] In the power supply system of this invention of a mode equipped with this connection switch, it shall have the motor generator connected to said ***** road side of said connection switch. If it carries out like this, two batteries can be charged with a motor generator.

[0010] Or in the power supply system of this invention, said actuation circuit shall be equipped with the supply interruption circuit which suspends actuation of said ***** by the electric supply from the battery of this another side, although said emergency switch is ON when the voltage of the battery of said another side turns into under predetermined voltage. If it carries out like this, the overdischarge of the battery of another side can be prevented.

[0011] Moreover, in the power supply system of this invention, it shall have a condition detection means to detect the condition of one [said] battery, and said ***** shall be equipped with the control circuit which controls the electric supply to electric supply Rhine of one [this] battery based on the condition of one [which was detected by said condition detection means / said] battery. If it carries out like this, based on the condition of one battery, the electric supply to electric supply Rhine is controllable. In the power supply system of this invention of this mode, said condition detection means shall be a means to detect the current which flows to one [said] battery, and said control circuit shall be a circuit controlled so that the electric supply to electric supply Rhine of one [said] battery is stopped, when the current detected by said condition detection means is under predetermined current.

[0012] In addition, in the power supply system of this invention, said ***** shall be a circuit to which electric power can be supplied from one [said] battery in electric supply Rhine of the battery of this another side possible [charge of the battery of said another side]. If it carries out like this, the battery of another side can be charged by electric supply from one battery.

[0013] In addition, the power supply system of this invention shall be a system which supplies power to the load which was carried in vehicles and carried in these vehicles.

[0014]

[Embodiment of the Invention] Next, the gestalt of operation of this invention is explained using an example. Drawing 1 is the block diagram showing the outline of the configuration of the power supply system 20 carried in the vehicles which are one example of this invention. The high-pressure battery 30 connected to the inverter 26 of a motor generator 24 through the relay 22 formed in high-tension-power Rhine 23 so that the power supply system 20 of an example might be illustrated, The low voltage battery 40 which supplies power to a load 34 through low-tension-power Rhine 32, Voltage is changed. DC-DC converter 42 in which the electric supply to low-tension-power Rhine 32 from high-tension-power Rhine 23 is possible, The ignition switch 44 which makes relay 22 turn on through diode 45 with the power supplied by low-tension-power Rhine 32, When it connects with high-tension-power Rhine 23 between the control unit 46 which controls the power supply system 20 whole, and relay 22 and the high-pressure battery 30 and an emergency switch 48 is turned on, relay 22 and a control unit 46 are equipped with the actuation circuit 50 which supplies the power of a low battery. The path which supplies the output of an actuation circuit 50 to relay 22 is made to serve a double purpose also as a path which impresses the voltage from an ignition switch 44 to a control circuit 46. In addition, in the example, the battery of 12V was used as a low voltage battery 40, using the battery of 36V as a high-pressure battery 30.

[0015] In the example, a motor generator 24 functions as a generator generated with the power outputted by the internal combustion engine while functioning as a starter motor which puts an internal combustion engine into operation.

[0016] DC-DC converter 42 is constituted as a DC to DC converter which transforms the voltage (an example 36 V-42V) supplied from high-tension-power Rhine 23 into the voltage (an example 14 V) which can drive [that the low voltage battery 40 can be charged and] a load 34 based on the control signal from a control unit 46, and supplies electric power to low-tension-power Rhine 32.

[0017] The control unit 46 contains the microcomputer constituted considering CPU as a center, and controls a system 20 by performing the control program beforehand stored in the microcomputer. The voltage of the low voltage battery 40 is incorporated to the switch terminal, and the current I which flows to the low voltage battery 40 detected by the current sensor 41 attached in the low voltage battery 40 is inputted into this control unit 46. Moreover, from the control unit 46, the control signal is outputted to the inverter 26 or DC-DC converter 42. Therefore, DC-DC converter 42 is having the output controlled so that the low voltage battery 40 does not become a surcharge according to the voltage of the low voltage battery 40, and the condition of current.

[0018] The actuation circuit 50 is constituted by the isolating switch 52 which will intercept connection if the voltage of

the high-pressure battery 30 turns into under predetermined voltage, the transistor 54 by which the base was connected to the emergency switch 48, and two resistance 56 and 58 which pressures partially the voltage from the high-pressure battery 30. Two resistance 56 and 58 is set up so that the partial pressure of the voltage from the high-pressure battery 30 may be carried out to a low battery (an example 12 V) and it may be outputted to power Rhine 59. Now, if an emergency switch 48 is set to ON, a transistor 54 will serve as ON and the voltage the partial pressure was carried out [voltage] by two resistance 56 and 58 will be impressed to relay 22 and a control unit 46 by power Rhine 59.

Therefore, by setting an emergency switch 48 to ON, even if a control unit 46 and relay 22 do not have the power supplied from low-tension-power Rhine 32, they can operate. In addition, in order to prevent a surroundings lump of current, diode 60 is formed in power Rhine 59.

[0019] Drawing 2 is explanatory drawing showing the outline of the configuration of an isolating switch 52. The isolating switch 52 consists of AND circuits which take the AND of two resistance R1 and R2 which pressures partially the voltage V_{in} from the high-pressure battery 30, and the voltage V_{in} from the high-pressure battery 30 and the voltage in which the partial pressure was carried out by two resistance R1 and R2 so that it may illustrate. When the voltage V_{in} from the high-pressure battery 30 falls to predetermined voltage, resistance R1 and R2 is set up so that it may judge that the voltage by which the partial pressure was carried out changed from Hi to Lo. Moreover, the output V_{out} from an AND circuit outputs the voltage V_{in} from the high-pressure battery 30 at the time of Hi, and outputs 0 [V] at the time of Lo. Therefore, an AND circuit functions considering the voltage V_{in} as an output, i.e., a switch of an ON state, when the voltage V_{in} from the high-pressure battery 30 is higher than predetermined voltage, and when voltage V_{in} is under predetermined voltage, it functions considering 0 [V] as an output, i.e., a switch of an OFF state.

[0020] Next, actuation of the power supply system 20 constituted in this way is explained. Now, the condition that the amount of accumulation of electricity of the low voltage battery 40 is very low, and the condition that the so-called battery went up are considered. Since an operator cannot receive supply of power for an ignition switch 44 from the low voltage battery 40 as ON at this time, neither a control unit 46 nor relay 22 can put the power supply system 20 into operation.

[0021] Voltage is adjusted in this condition and the power with which an operator is supplied from the high-pressure battery 30 in an emergency switch 48 by ON, then the transistor 54 of an actuation circuit 50 serving as ON is supplied to a control unit 46 and relay 22 through power Rhine 59 at it. Therefore, relay 22 serves as ON.

[0022] If power is supplied to a control unit 46 by setting an emergency switch 48 to ON, a control unit 46 will perform the emergency processing program which is not illustrated, and will output the control signal of the purport which supplies power to the low-tension-power Rhine 32 side from the high-tension-power Rhine 23 side to DC-DC converter 42. DC-DC converter 42 functions with the output of this control signal, and through DC-DC converter 42, the power supplied from the high-pressure battery 30 is transformed into the voltage which can drive [that the low voltage battery 40 can be charged and] a load 34, and is supplied to low-tension-power Rhine 32. Therefore, a load 34 can be made to drive now. Moreover, a control unit 46 can also drive a motor generator 24 from outputting a control signal also to an inverter 26. Therefore, as a result of driving a motor generator 24 and a load 34, the power system of vehicles including an internal combustion engine can be put into operation.

[0023] Now, even if an emergency switch 48 will be set to OFF after that if power is supplied to low-tension-power Rhine 32 by setting an emergency switch 48 to ON since an ignition switch 44 is ON, since a control unit 46 and relay 22 operate with the power supplied to low-tension-power Rhine 32 through DC-DC converter 42, they can maintain this condition. Therefore, an emergency switch 48 is always off, and only when switch actuation is carried out, it can be considered as the so-called mho mentor RION type used as ON of switch.

[0024] In addition, since an isolating switch 52 does not turn on when the voltage of the high-pressure battery 30 is lower than predetermined voltage, supply of the power to the relay 22 or control unit 46 by the actuation circuit 50 cannot be performed. Moreover, if the voltage of the high-pressure battery 30 becomes lower than predetermined voltage when supply of the power to the relay 22 and control unit 46 by the actuation circuit 50 is performed, an isolating switch 52 will become off and supply of the power to the relay 22 and control unit 46 by the actuation circuit 50 will be suspended. In this case, if it is after relay 22 and a control unit 46 once operating and driving DC-DC converter 42, since relay 22 and a control unit 46 will operate with the power supplied to low-tension-power Rhine 32 through DC-DC converter 42, even if an isolating switch 52 becomes off, the power supply system 20 operates.

[0025] Drawing 3 is a flow chart which shows an example of the charge control manipulation routine performed by the control unit 46, when an emergency switch 48 is set to ON and power is supplied to low-tension-power Rhine 32 through DC-DC converter 42. Repeat activation of this routine is carried out for every (every [for example,] 8msec) predetermined time from from immediately after starting conversion of the voltage by DC-DC converter 42. If this routine is performed, a control unit 46 will perform processing which reads the current I which flows first the low

voltage battery 40 detected by the current sensor 41 (step S100). And the read current I is compared with a threshold I_{ref} (step S102). Here, the threshold I_{ref} was established in order to suspend charge of the low voltage battery 40, and in the example, when the full charge of the low voltage battery 40 was carried out, it was set as the current value which flows to the low voltage battery 40, or the value higher than this.

[0026] When the current I which flows the low voltage battery 40 is beyond the threshold I_{ref} , it judges that charge is not completed and this routine is ended. On the other hand, when Current I is under the threshold I_{ref} , it judges that charge was completed, a control signal is outputted to DC-DC converter 42, actuation of DC-DC converter 42 is suspended (step S104), and this routine is ended.

[0027] According to the power supply system 20 of an example explained above, even if the low voltage battery 40 goes up, by setting an emergency switch 48 to ON, the power supply system 20 can be started using the power from the high-pressure battery 30, and a motor generator 24 and a load 34 can be driven. And the low voltage battery 40 can be charged in parallel with the drive of starting and the motor generator 24 of this system, or a load 34.

[0028] Moreover, according to the power supply system 20 of an example, since an isolating switch 52 is turned off when the voltage of the high-pressure battery 30 becomes lower than predetermined voltage, the overdischarge of the high-pressure battery 30 can be prevented.

[0029] Furthermore, according to the power supply system 20 of an example, based on the current I which flows to the low voltage battery 40, the completion of charge of the low voltage battery 40 can be judged, conversion of the voltage by DC-DC converter 42 can be suspended, and charge of the low voltage battery 40 can be suspended. Consequently, the surcharge of the low voltage battery 40 can be prevented.

[0030] Although constituted from a power supply system 20 of an example as a DC to DC converter which carries out voltage conversion of the power to which DC-DC converter 42 is supplied from high-tension-power Rhine 23 based on the control signal from a control unit 46, and is supplied to low-tension-power Rhine 32, carrying out voltage conversion of the power supplied from low-tension-power Rhine 32, and supplying high-tension-power Rhine 23 may also constitute as a DC to DC converter of possible bidirection. If it carries out like this, even when the high-pressure battery 30 will have gone up, while being able to put the power supply system 20 into operation using the power from the low voltage battery 40 and being able to drive a motor generator 24 and a load 34, the high-pressure battery 30 can be charged.

[0031] Although the low voltage battery 40 was used as 12V battery in the power supply system 20 of an example while using the high-pressure battery 30 as 36V battery, it is not limited to this and the battery of what kind of rated voltage may be used.

[0032] Although the charge condition of the low voltage battery 40 was judged in the power supply system 20 of an example based on the current I detected by the current sensor 41, it is good also as what is judged based on the amount (SOC) of accumulation of electricity which it is not limited to this and calculated based on Current I and voltage V .

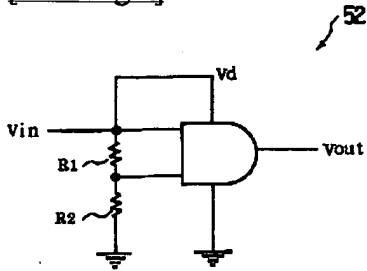
[0033] Although the power supply system 20 of an example explained as what is carried in vehicles, of course, it is applicable also to the power supply system which is not carried in vehicles.

[0034] As mentioned above, although the gestalt of operation of this invention was explained using the example, as for this invention, it is needless to say that it can carry out with the gestalt which becomes various within limits which are not limited to such an example at all and do not deviate from the summary of this invention.

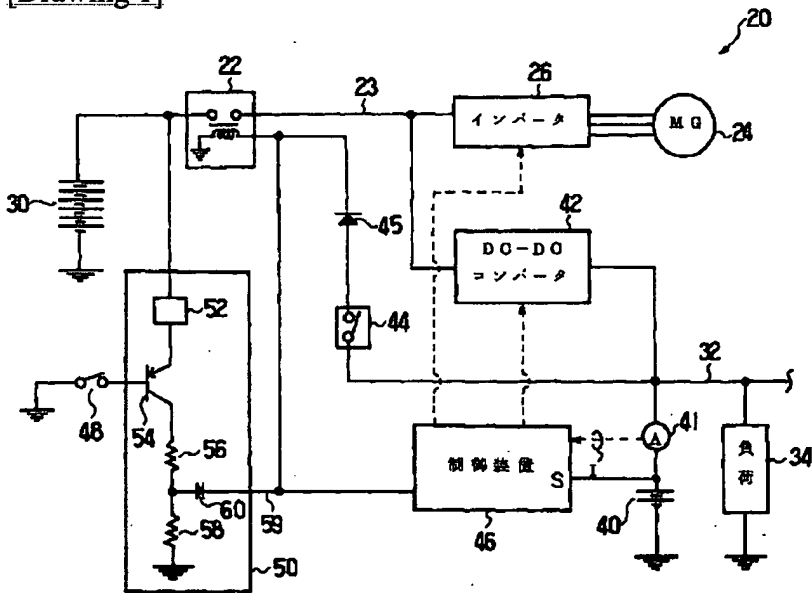
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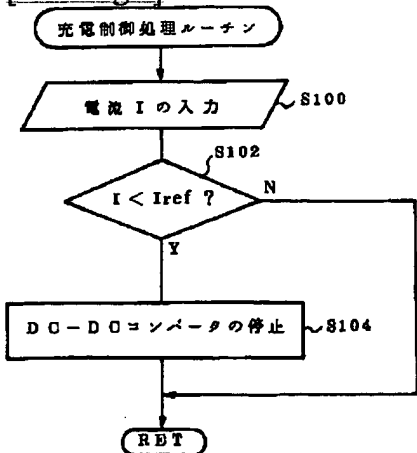
[Drawing 2]



[Drawing 1]



[Drawing 3]



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